

**Research & Vehicle Technology**

**“Infotainment Systems Product Development”**

**Feature – Volume**

**APIM Infotainment Subsystem Part Specific Specification (SPSS)**

Version 1.3

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**Version Date: January 31, 2018**

**FORD CONFIDENTIALF**

**Revision History**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Date** | **Version** | **Notes** | | |
| **May 30, 2013** | **1.0** | **Initial Release** | |  |
|  |  |  | |  |
| **June 5, 2014** | **1.1** | **Updated Release** | |  |
|  | VOL-FUR-REQ-014819/A-Volume Attenuation/Restoration (TcSE ROIN-27919-9) | | | jmyslin2/SORRIS1 - updated for eCall volume |
|  | VOL-FUR-REQ-014819/D-Volume Attenuation/Restoration (TcSE ROIN-27919-9) | | | 2014-03-17 DWALUS: Revised from TCsE to VSEM format. |
|  | VOL-UC-REQ-014827/C-Increase Media Volume (TcSE ROIN-290273-1) | | | 2014-03-17 DWALUS: Revised from TCsE to VSEM format. |
|  | VOL-UC-REQ-014829/C-Decrease Media Volume (TcSE ROIN-290395-1) | | | 2014-03-17 DWALUS: Revised from TCsE to VSEM format. |
|  | VOL-UC-REQ-014833/C-Adjust Phone Volume (TcSE ROIN-290402-1) | | | 2014-03-17 DWALUS: Revised from TCsE to VSEM format. |
|  | VOL-UC-REQ-014834/C-Adjust TA Volume (TcSE ROIN-290403-1) | | | 2014-03-17 DWALUS: Revised from TCsE to VSEM format. |
|  | VOL-UC-REQ-014836/C-Infotainment System exits TA Mode with storing (TcSE ROIN-290404-1) | | | 2014-03-17 DWALUS: Revised from TCsE to VSEM format. |
|  | VOL-UC-REQ-014837/C-Infotainment System exits TA Mode without storing (TcSE ROIN-290405-1) | | | 2014-03-17 DWALUS: Revised from TCsE to VSEM format. |
|  | VOL-UC-REQ-014843/C-Activating the Feature Volume at the Media Volume (TcSE ROIN-291882-1) | | | 2014-03-17 DWALUS: Revised from TCsE to VSEM format. |
|  | VOL-SR-REQ-014858/C-Module specific volume requirements (TcSE ROIN-110928-5) | | | <jmyslin2> Updated so Volume Setting Client can receive SetVolume from Rear Seat Controller and the Volume Setting Client (ex SYNC Gen 3) transmits the SetVolume to the Volume Setting Server |
|  |  |  | |  |
| **April 29, 2015** | **1.2** | **Updated Release** | |  |
|  | VOLv2-UC-REQ-014842/C-Activating the Upper Feature Volume Border (TcSE ROIN-291881-1) | | | 2015-01-28 MDAGE: Removed TA from this use case and pre-condition that media volume is lower than feature volume upper border. Added pre-condition that feature source is not currently active. |
|  | VOLv2-UC-REQ-014845/C-Activating the Feature Volume at the last Feature Volume Level (TcSE ROIN-291883-1) | | | 2015-01-28 MDAGE: Removed pre-condition that media volume had to be below feature volume and removed TA from this use-case. Added pre-condition that feature source is not currently active. |
|  | VOLv2-UC-REQ-014846/C-Activating the Lower Volume Border (TcSE ROIN-291885-1) | | | 2015-01-28 MDAGE: Removed TA from this use-case and pre-condition that media volume is below feature volume lower border. Added pre-condition that feature source is not currently active. |
|  | VOLv2-UC-REQ-129751/A-Activating the TA Feature Volume at the last Feature Volume Level | | | 2015-01-28 MDAGE: Initial release |
|  | VOLv2-UC-REQ-129752/A-Activating the TA Lower Volume Border | | | 2015-01-28 MDAGE: Initial Release |
|  | VOLv2-UC-REQ-129753/A-Activating the TA Upper Feature Volume Border | | | 2015-01-18 MDAGE: Initial Release |
|  | VOL-SR-REQ-014857/C-Manual Audio Mute (TcSE ROIN-205228-2)+ | | | <jmyslin2 / Nor Von wahl (HMI team)> Updated requirement so that the volume is increased from the volume right before the manual audio mute per the HMI team. |
|  | VOL-SR-REQ-014858/G-Module specific volume requirements (TcSE ROIN-110928-5) | | | <jmyslin2> Updated for LIN ICP connected to system master (ex CHR/APIM Gen 3) |
| |  |  |  |  | | --- | --- | --- | --- | |  |  |  |  | | |  |  |  |  | | --- | --- | --- | --- | |  |  |  |  | | | | |  |  |  |  | | --- | --- | --- | --- | |  |  |  |  | |
| **January 31, 2018** | **1.3** | | **Updated Release** |  |
|  | VOL-SR-REQ-292289/A-Volume Press and Hold Error Handling | | | <jmyslin2> New Requirement |
|  | VOL-TMR-REQ-292290/A-T\_Vol\_RBAP\_Timeout | | | <jmyslin2> New Requirement |
|  | VOL-SR-REQ-014858/G-Module specific volume requirements (TcSE ROIN-110928-5) | | | <jmyslin2> Updated for LIN ICP connected to system master (ex CHR/APIM Gen 3) |
|  | MD-REQ-275444/A-SetVolume+ | | | <jmyslin2> Put interface table description in MD form. Not requirement content change and only a clarification and formatting update |
|  | MD-REQ-275444/B-SetVolume | | | <jmyslin2> Updated signal description |
|  | MD-REQ-276034/A-SetVol\_Level | | | <jmyslin2> Updated signal description |
|  | MD-REQ-276074/A-SetVol\_Source | | | <jmyslin2> Updated signal description |
|  | MD-REQ-276073/A-SetVolume (LIN network only) | | | <jmyslin2> Updated signal description |
|  | MD-REQ-276097/A-Audio\_Vol\_Level | | | <jmyslin2> Updated signal description |
|  | MD-REQ-276098/A-Audio\_Vol\_Updated | | | <jmyslin2> Updated signal description |
|  | MD-REQ-276184/A-Phone\_Vol\_Level | | | <jmyslin2> MD for signal |
|  | MD-REQ-276185/A-Phone\_Vol\_Updated | | | <jmyslin2> MD for Phone |
|  | MD-REQ-276186/A-Prompt\_Vol\_Level | | | <jmyslin2> MD for signal |
|  | MD-REQ-276187/A-Prompt\_Vol\_Updated | | | <jmyslin2> MD for Phone |
|  | MD-REQ-276188/A-TA\_Vol\_Level | | | <jmyslin2> MD for signal |
|  | MD-REQ-276189/A-TA\_Vol\_Updated | | | <jmyslin2> MD signal |
|  | MD-REQ-276190/A-VR\_Vol\_Level | | | <jmyslin2> MD for signal |
|  | MD-REQ-276191/A-VR\_Vol\_Updated | | | <jmyslin2> MD signal |
|  | VOL-FUR-REQ-026147/C-Press & Hold Volume Control MFD / APIM (TcSE ROIN-202657-2) | | | <jmyslin2> added tolerance |
|  | VOL-FUR-REQ-014819/H-Volume Attenuation/Restoration (TcSE ROIN-27919-9)+ | | | 2016-05-19 MDAGE: Changed Attenuation 5 from volume step 7 to volume step 5 to correct a misinterpretation of gain vs attenuation which led to the previous change. |
|  | VOL-FUR-REQ-014819/I-Volume Attenuation/Restoration (TcSE ROIN-27919-9) | | | 2017-08-23 MDAGE: Removed statement that attenuation levels shall be maintained in a calibration file. |
|  | VOL-SR-REQ-014851/D-Volume Setting Server Incrementing Volume via the EFP/ECP and SWC (TcSE ROIN-39827-2) | | | <jmyslin2> added clarification for the requirement for CGEA 1.2 only. No content change |
|  | VOL-SR-REQ-014857/E-Manual Audio Mute (TcSE ROIN-205228-2) | | | <jmyslin2> Per the HMI team (Nora Von wahl / Karl Vandivier) and core audio (Dan Lebioda / Matt Dage) a volume down will cancel a manual audio mute (not just a volume up). |

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# Architectural Design

## Volume Control Interface Requirements

### MD-REQ-275444/B-SetVolume

**Message Type**: Request

Signal for incrementing / decrementing volume (used with a rotary volume knob)

|  |  |  |  |
| --- | --- | --- | --- |
| **Logical Signal Name** | **Literals** | **Value** | **Description** |
| SetVolume | -30 steps | 0x0 |  |
| -29 steps | 0x1 |  |
| -28 steps | 0x2 |  |
| …continued |  |  |
| -2 steps | 0x1C |  |
| -1 step | 0x1D | Decrements volume |
| Not Pressed / Inactive | 0x1E |  |
| +1 step | 0x1F | Increments volume |
| +2 steps | 0x20 |  |
| +3 steps | 0x21 |  |
| …continued |  |  |
| +30 steps | 0x3C |  |

### MD-REQ-276034/A-SetVol\_Level

**Message Type**: Request

Signal for selecting a particular volume level

|  |  |  |  |
| --- | --- | --- | --- |
| **Logical Signal Name** | **Literals** | **Value** | **Description** |
| SetVol\_Level | Not Pressed / Inactive | 0x0 | Note: also called SetPointVolume in some SPSS features |
| No Volume | 0x1 |
| Vol\_Step1 | 0x2 |
| Vol\_Step2 | 0x3 |
| Vol\_Step3 | 0x4 |
| Continued |  |
| Vol\_Step30 | 0x1F |

### MD-REQ-276074/A-SetVol\_Source

**Message Type**: Request

Signal for commanding the Volume Settings Server what source volume to adjust.

|  |  |  |  |
| --- | --- | --- | --- |
| **Logical Signal Name** | **Literals** | **Value** | **Description** |
| SetVol\_Source | Inactive | 0x0 | This has to be in the same message as the SetVol\_Level.Rq and SetVolume.Rq signals that are to be used with this signal. |
| SetTAVolume | 0x1 |
| SetPromptVolume | 0x2 |
| SetPhoneVolume | 0x3 |
| SetVRVolume | 0x4 |
| SetAudioVolume | 0x5 |

### MD-REQ-276073/A-SetVolume (LIN network only)

**Message Type**: Request

LIN signal (as opposed to CAN) for incrementing / decrementing volume (used with a rotary volume knob)

|  |  |  |  |
| --- | --- | --- | --- |
| **Logical Signal Name** | **Literals** | **Value** | **Description** |
| SetVolume (LIN network only) | -7 steps | 0x0 |  |
| -6 steps | 0x1 |  |
| -5 steps | 0x2 |  |
| cont. |  |  |
| -2 steps | 0x5 |  |
| -1 steps | 0x6 | Decrements volume |
| Not Pressed / Inactive | 0x7 |  |
| +1 steps | 0x8 | Increments volume |
| +2 steps | 0x9 |  |
| cont. |  |  |
| +5 steps | 0xC |  |
| +6 steps | 0xD |  |
| +7 steps | 0xE |  |

### MD-REQ-276097/A-Audio\_Vol\_Level

**Message Type**: Status

Signal from the Volume Setting Server indicating the volume level for the media sources (ex. Radio, CD, USB, Sat, Aux…).

|  |  |  |  |
| --- | --- | --- | --- |
| **Logical Signal Name** | **Literals** | **Value** | **Description** |
| Audio\_Vol\_Level | No Volume | 0x0 |  |
| Vol\_Step1 | 0x1 |
| Vol\_Step2 | 0x2 |
| Vol\_Step3 | 0x3 |
| cont. |  |
| Vol\_Step30 | 0x1E |

### MD-REQ-276098/A-Audio\_Vol\_Updated

**Message Type**: Status

Signal from the Volume Setting Server to indicate if the media volume is being updated for the HMI.

|  |  |  |  |
| --- | --- | --- | --- |
| **Logical Signal Name** | **Literals** | **Value** | **Description** |
| Audio\_Vol\_Updated | No Update | 0x0 | This signal needs to be in the same message as the Audio\_Vol\_Level.St signal. |
| Updated | 0x1 |

### MD-REQ-276184/A-Phone\_Vol\_Level

**Message Type**: Status

Signal from the Volume Setting Server indicating the volume level for the Phone source

|  |  |  |  |
| --- | --- | --- | --- |
| **Logical Signal Name** | **Literals** | **Value** | **Description** |
| Phone\_Vol\_Level | No Volume | 0x0 |  |
| Vol\_Step1 | 0x1 |
| Vol\_Step2 | 0x2 |
| Vol\_Step3 | 0x3 |
| cont. |  |
| Vol\_Step30 | 0x1E |

### MD-REQ-276185/A-Phone\_Vol\_Updated

**Message Type**: Status

Signal from the Volume Setting Server to indicate if the phone volume is being updated for the HMI.

|  |  |  |  |
| --- | --- | --- | --- |
| **Logical Signal Name** | **Literals** | **Value** | **Description** |
| Phone\_Vol\_Updated | No Update | 0x0 | This signal needs to be in the same message as the Phone\_Vol\_Level.St signal. |
| Updated | 0x1 |

### MD-REQ-276186/A-Prompt\_Vol\_Level

**Message Type**: Status

Signal from the Volume Setting Server indicating the volume level for the mixable prompt source

|  |  |  |  |
| --- | --- | --- | --- |
| **Logical Signal Name** | **Literals** | **Value** | **Description** |
| Prompt\_Vol\_Level | No Volume | 0x0 |  |
| Vol\_Step1 | 0x1 |
| Vol\_Step2 | 0x2 |
| Vol\_Step3 | 0x3 |
| cont. |  |
| Vol\_Step30 | 0x1E |

### MD-REQ-276187/A-Prompt\_Vol\_Updated

**Message Type**: Status

Signal from the Volume Setting Server to indicate if the mixable prompt volume is being updated for the HMI.

|  |  |  |  |
| --- | --- | --- | --- |
| **Logical Signal Name** | **Literals** | **Value** | **Description** |
| Prompt\_Vol\_Updated | No Update | 0x0 | This signal needs to be in the same message as the Prompt\_Vol\_Level.St signal. |
| Updated | 0x1 |

### MD-REQ-276188/A-TA\_Vol\_Level

**Message Type**: Status

Signal from the Volume Setting Server indicating the volume level for the TA (Traffic Announcement) source

|  |  |  |  |
| --- | --- | --- | --- |
| **Logical Signal Name** | **Literals** | **Value** | **Description** |
| TA\_Vol\_Level | No Volume | 0x0 |  |
| Vol\_Step1 | 0x1 |
| Vol\_Step2 | 0x2 |
| Vol\_Step3 | 0x3 |
| cont. |  |
| Vol\_Step30 | 0x1E |

### MD-REQ-276189/A-TA\_Vol\_Updated

**Message Type**: Status

Signal from the Volume Setting Server to indicate if the TA volume is being updated for the HMI.

|  |  |  |  |
| --- | --- | --- | --- |
| **Logical Signal Name** | **Literals** | **Value** | **Description** |
| TA\_Vol\_Updated | No Update | 0x0 | This signal needs to be in the same message as the TA\_Vol\_Level.St signal. |
| Updated | 0x1 |

### MD-REQ-276190/A-VR\_Vol\_Level

**Message Type**: Status

Signal from the Volume Setting Server indicating the volume level for the VR (Voice Recognition) source

|  |  |  |  |
| --- | --- | --- | --- |
| **Logical Signal Name** | **Literals** | **Value** | **Description** |
| VR\_Vol\_Level | No Volume | 0x0 |  |
| Vol\_Step1 | 0x1 |
| Vol\_Step2 | 0x2 |
| Vol\_Step3 | 0x3 |
| cont. |  |
| Vol\_Step30 | 0x1E |

### MD-REQ-276191/A-VR\_Vol\_Updated

**Message Type**: Status

Signal from the Volume Setting Server to indicate if the VR volume is being updated for the HMI.

|  |  |  |  |
| --- | --- | --- | --- |
| **Logical Signal Name** | **Literals** | **Value** | **Description** |
| VR\_Vol\_Updated | No Update | 0x0 | This signal needs to be in the same message as the VR\_Vol\_Level.St signal. |
| Updated | 0x1 |

## VOL-CLD-REQ-014813/B-Volume Button Input Client (Volume Button Transmitter) (TcSE ROIN-202553-1)

The Volume Button Input Client is the volume button press interface for the volume function

## VOL-CLD-REQ-026161/A-Volume Settings Server (TcSE ROIN-202554-1)

The Volume Settings Server is responsible for controlling the volume output level.

## VOL-CLD-REQ-026160/A-Volume Settings Client - SYNC (TcSE ROIN-202654-2)

The Volume Settings Client is the interface of the Volume Settings function as called out in the SPSS and as the interface for the volume HMI Output.

### VOL-FUR-REQ-026147/C-Press & Hold Volume Control MFD / APIM (TcSE ROIN-202657-2)

When the volume Steering Wheel Controls are hardwired to the MFD / APIM then the MFD / APIM shall support the press and hold volume feature.

When the CAN volume button presses are sent to the MFD / APIM that result in the MFD / APIM sending the SetVolume signal to the Volume Settings Server then the MFD / APIM shall support press and hold volume feature. See requirement "VOLSYS-GREQ-014858-Module specific volume requirements" for when the MFD / APIM sends the SetVolume signal.

The MFD / APIM shall send a single SetVolume increment / decrement to the Volume Settings Server when the volume button press the MFD / APIM receives is initially pressed.

When the volume button is held longer than Tvolume\_button\_held then the MFD / APIM shall increment / decrement the SetVolume signal to the Volume Settings Server every 100 milliseconds (+/- 10%) the until the button is released.

### VOL-TMR-REQ-014823/C-Volume Button Held Timer (TcSE ROIN-169727-3)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | **Description** | **Units** | **Range** | **Resolution** | **Default** |
| Volume Button Held Timer | Tvolume\_button\_held is a timer used to determine if the volume button (from steering wheel controls, etc) has been held.  Note: Use the default value | msec | 200 - 2000 | 100 | 500 |

### VOL-FUR-REQ-014819/I-Volume Attenuation/Restoration (TcSE ROIN-27919-9)

**Audio Volume Attenuation**

The AHU/DSP amp shall meet the following requirements when receiving an *Attn\_Info\_Audio\_* request:

   Audio Attenuation for chimes (ex. IPC\_Infotainment : Attn\_Info\_Audio) shall apply to both the active audio source (media, phone, VR, TA, Resource Update Prompts) and alerts (SYNC prompts and beeps).

Exception: Audio Attenuation for chimes shall not apply to emergency phone call conditions as defined in EASSIST-SR-REQ-014809-Emergency Phone Call Conditions

Note: for beeps at a minimum Attenuation 6 shall be supported (full mute). Reference applicable beep attenuation requirements/specifications if Attenuation 1 – Attenuation 5 are supported for beeps.

   Audio Attenuation for prompts (from the prompt generator – ex SYNC) shall apply to only the active audio source (media, phone, VR, TA) and shall NOT attenuate prompts, chimes and beeps.

Exception: Audio Attenuation for prompts shall not apply to emergency phone call conditions as defined in EASSIST-SR-REQ-014809-Emergency Phone Call Conditions

   The audio volume shall only be attenuated if the level is above the specified attenuation level (Table 8.4.14).

   The volume shall not be user-adjustable during a Full Mute Audio Volume Attenuation event, unless otherwise noted. Upon exiting a full mute Audio Volume Attenuation event, the volume shall either be restored to the level just prior to the Audio Volume Attenuation event or to the next highest Audio Volume Attenuation level if another attenuation request is active.

   If the volume is NOT user adjusted during an Audio Volume Attenuation event, upon exiting, the volume shall either be restored to the level just prior to the Audio Volume Attenuation event or to the next highest Audio Volume Attenuation level if another attenuation request is active.

   If the user adjusts the volume during a partial Audio Volume Attenuation or Audio Volume Restoration event, the Audio Volume Attenuation or Audio Volume Restoration shall be cancelled and the volume level shall follow the user adjustment, except as noted above for a full mute attenuation.

   The AHU/DSP shall meet the Audio Volume Restoration requirements when transitioning to a new attenuation level.

**Table 8.4.14**

|  |  |  |
| --- | --- | --- |
| **Attenuation Level** | **Volume Step** | **Volume relative from max (0 dB)** |
| Attenuation 0 | No Attenuation | No Attenuation |
| Attenuation 1 | 18 | -15.50 dB |
| Attenuation 2 | 15 | -20.75 dB |
| Attenuation 3 | 13 | -24.75 dB |
| Attenuation 4 | 12 | -27.00 dB |
| Attenuation 5 | 5 | -48.25 dB |
| Attenuation 6 | Full Mute | Full Mute |
| Unknown | No Attenuation | No Attenuation |

**Audio Volume Restoration**

When an Audio Volume Attenuation changes to a less restrictive audio attenuation level, the AHU/DSP shall restore the volume level as defined in SPSS requirement “VOL-FUR-REQ-088208-Audio Attenuation/Restoration”.

**Audio Volume Attenuation Fault Conditions**

If the above signal is not received for 5 seconds or the signal state is set to 0x7 (Unknown), the AHU/DSP shall default to a "No Attenuation" condition.

# Functional Definition

## VOL-FUN-REQ-014826/A-Volume Control (TcSE ROIN-120283-1)

### Use Cases

#### VOL-UC-REQ-014827/D-Increase Media Volume (TcSE ROIN-290273-1)

|  |  |
| --- | --- |
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment System is powered ON  Media source is active (ex CD, USB, AM/FM…) |
| **Scenario Description** | User selects <Increase Volume> via HMI. The infotainment system adjusts the media volume setting. HMI indicates {Media Volume Level} as level is being adjusted. |
| **Post-conditions** | HMI indicates final {Media Volume Setting}. The infotainment system will operate with updated media volume level. |
| **List of Exception Use Cases** | VOL-UC-REQ-014828-Increase Media Volume - Volume currently set to maximum |
| **Interfaces** | G-HMI, CBI, SWC |

#### VOL-UC-REQ-014828/B-Increase Media Volume - Volume currently set to maximum (TcSE ROIN-290275-1)

**Linked Elements**

VOL-UC-REQ-014827/D-Increase Media Volume (TcSE ROIN-290273-1)

|  |  |
| --- | --- |
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment System is powered ON  Media source is active (ex CD, USB, AM/FM…)  Media volume is currently at max volume |
| **Scenario Description** | User selects <Increase Volume> via HMI. |
| **Post-conditions** | Media Volume setting remains unchanged. HMI indicates {Media Volume Setting}. |
| **List of Exception Use Cases** | N/A |
| **Interfaces** | G-HMI, CBI, SWC |

#### VOL-UC-REQ-014829/D-Decrease Media Volume (TcSE ROIN-290395-1)

|  |  |
| --- | --- |
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment System is powered ON  Media source is active (ex CD, USB, AM/FM…) |
| **Scenario Description** | User selects <Decrease Volume> via HMI. The infotainment system adjusts the media volume setting. HMI indicates {Media Volume Level} as level is being adjusted. |
| **Post-conditions** | HMI indicates final {Media Volume Setting}. The infotainment system will operate with updated media volume level. |
| **List of Exception Use Cases** | VOL-UC-REQ-014830-Decrease Media Volume - Volume currently set to minimum |
| **Interfaces** | G-HMI, CBI, SWC |

#### VOL-UC-REQ-014830/B-Decrease Media Volume - Volume currently set to minimum (TcSE ROIN-290396-1)

**Linked Elements**

VOL-UC-REQ-014829/D-Decrease Media Volume (TcSE ROIN-290395-1)

|  |  |
| --- | --- |
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment System is powered ON  Media source is active (ex CD, USB, AM/FM…)  Media volume is currently at minimum volume (no volume) |
| **Scenario Description** | User selects <Decrease Volume> via HMI. |
| **Post-conditions** | Volume setting remains unchanged. HMI indicates {Media Volume Setting}. |
| **List of Exception Use Cases** | N/A |
| **Interfaces** | G-HMI, CBI, SWC |

#### VOL-UC-REQ-014831/D-Adjusts Voice Recognition (VR) Volume (TcSE ROIN-290398-1)

|  |  |
| --- | --- |
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment System is powered ON  VR is the active audio source |
| **Scenario Description** | User selects <Increase/Decrease Volume> via HMI. The infotainment system adjusts the VR volume setting. HMI indicates {VR Volume Level} as level is being adjusted. |
| **Post-conditions** | HMI indicates final {VR Volume Setting}. The infotainment system will operate with updated VR volume level. |
| **List of Exception Use Cases** | Reference the Media volume use case exceptions (currently at min and max volume) which applies to all volume sources (Media, VR, Prompts, Phone, TA)  E1- [VOL-GUC-290275-Increase Media Volume - Volume currently set to maximum](http://ivs02.pd3.ford.com:8080/tcr/controller/ObjLauncher?wolf_objectid=19.0.79140672&LID=19.0.79140672&tcr_symbolic_target_id=19.0.79140672&tcr_symbolic_property_id=2.0.4153)  E2 - [VOL-GUC-290396-Decrease Media Volume - Volume currently set to minimum](http://ivs02.pd3.ford.com:8080/tcr/controller/ObjLauncher?wolf_objectid=19.0.79204909&LID=19.0.79204909&tcr_symbolic_target_id=19.0.79204909&tcr_symbolic_property_id=2.0.4153) |
| **Interfaces** | G-HMI, CBI, SWC |

#### VOL-UC-REQ-014832/C-Adjust Prompt Volume (TcSE ROIN-290401-1)

|  |  |
| --- | --- |
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment System is powered ON  Mixable Prompt are the active audio source (ex navigation prompts, TTS…) |
| **Scenario Description** | User selects <Increase/Decrease Volume> via HMI. The infotainment system adjusts the Prompt volume setting. HMI indicates {Prompt Volume Level} as level is being adjusted. |
| **Post-conditions** | HMI indicates final {Prompt Volume Setting}. The infotainment system will operate with updated Prompt volume level. |
| **List of Exception Use Cases** | Reference the Media volume use case exceptions (currently at min and max volume) which applies to all volume sources (Media, VR, Prompts, Phone, TA)  E1-[VOL-GUC-290275-Increase Media Volume - Volume currently set to maximum](http://ivs02.pd3.ford.com:8080/tcr/controller/ObjLauncher?wolf_objectid=19.0.79140672&LID=19.0.79140672&tcr_symbolic_target_id=19.0.79140672&tcr_symbolic_property_id=2.0.4153)  E2-[VOL-GUC-290396-Decrease Media Volume - Volume currently set to minimum](http://ivs02.pd3.ford.com:8080/tcr/controller/ObjLauncher?wolf_objectid=19.0.79204909&LID=19.0.79204909&tcr_symbolic_target_id=19.0.79204909&tcr_symbolic_property_id=2.0.4153) |
| **Interfaces** | G-HMI, CBI, SWC |

#### VOL-UC-REQ-014833/D-Adjust Phone Volume (TcSE ROIN-290402-1)

|  |  |
| --- | --- |
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment System is powered ON  Phone is the active audio source |
| **Scenario Description** | User selects <Increase/Decrease Volume> via HMI. The infotainment system adjusts the Phone volume setting. HMI indicates {Phone Volume Level} as level is being adjusted. |
| **Post-conditions** | HMI indicates final {Phone Volume Setting}. The infotainment system will operate with updated Phone volume level. |
| **List of Exception Use Cases** | Reference the Media volume use case exceptions (currently at min and max volume) which applies to all volume sources (Media, VR, Prompts, Phone, TA)  VOL-UC-REQ-014828-Increase Media Volume - Volume currently set to maximum  VOL-UC-REQ-014830-Decrease Media Volume - Volume currently set to minimum |
| **Interfaces** | G-HMI, CBI, SWC |

#### VOL-UC-REQ-014834/D-Adjust TA Volume (TcSE ROIN-290403-1)

|  |  |
| --- | --- |
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment System is powered ON  TA Mode is active |
| **Scenario Description** | User selects <Increase/Decrease Volume> via HMI. The infotainment system adjusts the TA volume setting. HMI indicates {TA Volume Level} as level is being adjusted. |
| **Post-conditions** | HMI indicates final {TA Volume Setting}. The infotainment system will operate with updated TA volume level.  Note: The TA volume is the same for all RDS related announcements like TA (Traffic Announcement), News and Alarm. |
| **List of Exception Use Cases** | Reference the Media volume use case exceptions (currently at min and max volume) which applies to all volume sources (Media, VR, Prompts, Phone, TA)  VOL-UC-REQ-014828-Increase Media Volume - Volume currently set to maximum  VOL-UC-REQ-014830-Decrease Media Volume - Volume currently set to minimum |
| **Interfaces** | G-HMI, CBI, SWC |

#### VOL-UC-REQ-014835/B-Volume Borders Variant 1 (TcSE ROIN-292457-1)

##### VOL-UC-REQ-014836/C-Infotainment System exits TA Mode with storing (TcSE ROIN-290404-1)

|  |  |
| --- | --- |
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment System is powered ON  TA Mode is active |
| **Scenario Description** | User selects <Increase/Decrease Volume> via HMI to a value inside the applicable borders and exits with storing conditions according to VOL-FUR-REQ-014816-User Volumes. |
| **Post-conditions** | HMI indicates final {TA Volume Setting}. The infotainment system will operate with updated TA volume level.  Stored Volume value becomes active volume level on next TA |
| **List of Exception Use Cases** |  |
| **Interfaces** | G-HMI, CBI, SWC |

##### VOL-UC-REQ-014837/C-Infotainment System exits TA Mode without storing (TcSE ROIN-290405-1)

|  |  |
| --- | --- |
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment System is powered ON  TA Mode is active |
| **Scenario Description** | User selects <Increase/Decrease Volume> via HMI and is interrupted by an higher level audio priority (ex. Phone, VR,…) or by entertainment off. Details of exist conditions according VOL-FUR-REQ-014816-User Volumes. |
| **Post-conditions** | The previous stored TA Volume becomes active volume level on next TA. |
| **List of Exception Use Cases** |  |
| **Interfaces** | G-HMI, CBI, SWC |

##### VOL-UC-REQ-014838/B-Activating the Upper Feature Volume Border - Phone/VR/Prompt (TcSE ROIN-290406-1)

|  |  |
| --- | --- |
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment System is powered ON.  Phone/Prompt/VR is not the active audio source  When the Feature volume was last active its volume level was above its upper volume border.  Feature Volume for this use case could be Phone/Prompt/VR |
| **Scenario Description** | A feature volume source becomes the active audio source |
| **Post-conditions** | The Feature Volume becomes active and its volume level will be at the upper feature volume border level. |
| **List of Exception Use Cases** |  |
| **Interfaces** | G-HMI, CBI, SWC |

##### VOL-UC-REQ-014839/B-Activating the Lower Volume Border - Phone/VR/Prompt (TcSE ROIN-290407-1)

|  |  |
| --- | --- |
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment System is powered ON.  Phone/Prompt/VR is not the active audio source.  When the Feature volume was last active its volume level was below its lower volume border.  Feature Volume for this use case could be Phone/Prompt/VR |
| **Scenario Description** | A feature volume source becomes the active audio source |
| **Post-conditions** | The feature volume becomes active and its volume level will be at the lower feature volume border level. |
| **List of Exception Use Cases** |  |
| **Interfaces** | G-HMI, CBI, SWC |

##### VOL-UC-REQ-014840/B-Activating the Feature volume at the last Feature Volume Level - Phone/VR/Prompt (TcSE ROIN-291884-1)

|  |  |
| --- | --- |
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment System is powered ON.  Phone/Prompt/VR is not the active audio source.  When the Feature volume was last active its volume level was below its upper volume border and above its lower volume border.  Feature Volume for this use case could be Phone/Prompt/VR |
| **Scenario Description** | A feature volume source becomes the active audio source |
| **Post-conditions** | The Feature Volume becomes active and its volume level will be at the last used feature volume level. |
| **List of Exception Use Cases** |  |
| **Interfaces** | G-HMI, CBI, SWC |

#### VOLv2-UC-REQ-014841/B-Volume Borders Variant 2 (TcSE ROIN-292458-1)

##### VOLv2-UC-REQ-014842/C-Activating the Upper Feature Volume Border (TcSE ROIN-291881-1)

|  |  |
| --- | --- |
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment System is powered ON.  No Feature source is currently active.  When the Feature source was last active its volume level was above its Upper volume border.  Feature Volume sources for this use case could be Prompts, Phone, or VR |
| **Scenario Description** | The Feature source becomes the active audio source |
| **Post-conditions** | The Feature Volume becomes active and its volume level will be at the upper volume border level. |
| **List of Exception Use Cases** |  |
| **Interfaces** | G-HMI, CBI, SWC |

##### VOLv2-UC-REQ-014845/C-Activating the Feature Volume at the last Feature Volume Level (TcSE ROIN-291883-1)

|  |  |
| --- | --- |
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment System is powered ON.  Feature source is not currently active.  When the Feature source was last active its volume level was below the upper Feature volume border and above the Feature lower volume border.  Feature Volume sources for this use case could be Prompts, Phone, or VR |
| **Scenario Description** | Feature source becomes the active audio source |
| **Post-conditions** | Feature volume becomes active and the previous Feature volume level will be active |
| **List of Exception Use Cases** |  |
| **Interfaces** | G-HMI, CBI, SWC |

##### VOLv2-UC-REQ-014846/C-Activating the Lower Volume Border (TcSE ROIN-291885-1)

|  |  |
| --- | --- |
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment System is powered ON.  Feature source is not currently active.  When the Feature souce was last active its volume level was below the Feature lower volume border level.  Feature Volume sources for this use case could be Prompts, Phone, or VR |
| **Scenario Description** | The Feature source becomes the active audio source |
| **Post-conditions** | Feature volume becomes active and the Feature volume level will be at the Feature lower volume border level |
| **List of Exception Use Cases** |  |
| **Interfaces** | G-HMI, CBI, SWC |

##### VOLv2-UC-REQ-014843/C-Activating the TA Feature Volume at the Media Volume (TcSE ROIN-291882-1)

|  |  |
| --- | --- |
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment System is powered ON.  Media Source (ex AM/FM, CD, USB…) is the active audio source and the Media volume is above the previous Feature volume level.  Feature Volume source for this use case is TA |
| **Scenario Description** | The Feature source becomes the active audio source |
| **Post-conditions** | The Feature Volume becomes active and its volume will be at the Media volume level |
| **List of Exception Use Cases** |  |
| **Interfaces** | G-HMI, CBI, SWC |

##### VOLv2-UC-REQ-129751/A-Activating the TA Feature Volume at the last Feature Volume Level

|  |  |
| --- | --- |
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment System is powered ON.  Media Source (ex AM/FM, CD, USB…) is the active audio source and the Media volume is below the previous Feature volume level.  When the Feature source was last active its volume level was below the upper Feature volume border and above the Feature lower volume border.  Feature Volume source for this use case is TA |
| **Scenario Description** | Feature source becomes the active audio source |
| **Post-conditions** | Feature volume becomes active and the previous Feature volume level will be active |
| **List of Exception Use Cases** |  |
| **Interfaces** | G-HMI, CBI, SWC |

##### VOLv2-UC-REQ-129752/A-Activating the TA Lower Volume Border

|  |  |
| --- | --- |
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment System is powered ON.  Media Source (ex AM/FM, CD, USB…) is the active audio source and the Media volume is below the Feature lower volume level border.  When the Feature source was last active its volume level was below the Feature lower volume border level.  Feature Volume source for this use case is TA |
| **Scenario Description** | The Feature source becomes the active audio source |
| **Post-conditions** | Feature volume becomes active and the Feature volume level will be at the Feature lower volume border level |
| **List of Exception Use Cases** |  |
| **Interfaces** | G-HMI, CBI, SWC |

##### VOLv2-UC-REQ-129753/A-Activating the TA Upper Feature Volume Border

|  |  |
| --- | --- |
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment System is powered ON.  Media Source (ex AM/FM, CD, USB…) is the active audio source and the Media volume is below the Feature upper volume limit.  When the Feature source was last active its volume level was above its Upper volume border.  Feature Volume source for this use case is TA |
| **Scenario Description** | The Feature source becomes the active audio source |
| **Post-conditions** | The Feature Volume becomes active and its volume level will be at the upper volume border level. |
| **List of Exception Use Cases** |  |
| **Interfaces** | G-HMI, CBI, SWC |

### Requirements

#### Volume Level Control

##### VOL-SR-REQ-014847/C-Audio Routing (TcSE ROIN-41507-12)

**Modules present: SYNC (Gen2 / Gen3) / AHU / No DSP AMP**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Source of signal**  **To AHU** | **Audio Channel** | **Volume Line Level Output** | **Volume Master** | **Distributes audio to Speakers** | **AHU** **Volume State** |
| External Media (Sync)  (RequestedAudioSource = 0x8: APIM  RequesterPriority = $B: Aux\_ExtSource) | Stereo In 1 | Fixed | AHU | AHU | Variable Gain |
| Phone (SYNC)  (RequestedAudioSource = 0x8: APIM or 0x6: Bluetooth Phone  RequesterPriority = 0x1: Telephony Service) | Stereo In 1 | Fixed | AHU | AHU | Variable Gain |
| VR Prompt (SYNC)  (RequestedAudioSource = $4: VoiceRecogniser  RequesterPriority = $4: PttMutevoice) | Stereo In 1 | Fixed | AHU | AHU | Variable Gain |
| Non-SYNC Prompt (Navigation) (RequestedAudio Source = 0xA Navigation  ResourceUpdate : RequesterPriority = 0x5 Nav User Voice Cmd or 0x6 Nav Sys Voice command) | N/A | Fixed | AHU | AHU | Variable Gain |
| Mobile Navigation  (RequestedAudio Source = 0xA Navigation  ResourceUpdate : RequesterPriority = 0xC Mobile Nav/Tel Mute) | N/A | Fixed | AHU | AHU | Variable Gain |
| Mixable Prompts (SYNC) | Prompt (SYNC Alert In 1 on Jan 2009 AHU Device Transmittal ) | Fixed | AHU | AHU | Variable Gain |
| Chimes (AHU) | N/A | N/A | AHU | AHU | Fixed Gain |
| TA Prompts (AHU) | N/A | N/A | AHU | AHU | Variable Gain |

**Modules present: SYNC (Gen 2 / Gen 3) / AHU / DSP AMP OR No SYNC / AHU / DSP AMP**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Source of signal**  **to DSP AMP** | **Audio Channel** | **Volume Line Level Output** | **Volume Master** | **Distributes audio to Speakers** | **DSP** **Volume State** |
| Media / Phone  (AHU) | Stereo 1 | \* Fixed | DSP | DSP | Variable Gain |
| VR Prompt (AHU)  (RequestedAudioSource = $4: VoiceRecogniser  RequesterPriority = $4: PttMutevoice) | Stereo 1 | Fixed | DSP | DSP | Variable Gain |
| Non-SYNC Prompt (Navigation) (RequestedAudioSource = 0xA Navigation  ResourceUpdate : RequesterPriority = 0x5 Nav User Voice Cmd or 0x6 Nav Sys Voice command) | N/A | Fixed | DSP | DSP | Variable Gain |
| Mobile Navigation  (RequestedAudio Source = 0xA Navigation  ResourceUpdate : RequesterPriority = 0xC Mobile Nav/Tel Mute) | N/A | Fixed | DSP | DSP | Variable Gain |
| Mixable Prompts (SYNC) | Prompt | Fixed | DSP | DSP | Variable Gain |
| Chimes (AHU) | Alert 1 & 2 | Fixed | DSP | DSP | Fixed Gain |
| TA Prompts (AHU) | Stereo | Fixed | DSP | DSP | Variable Gain |

\* unless specified otherwise for specific requirements.

**Modules present: SYNC / DSP AMP (if SYNC and DSP AMP support S/PDIF)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Source of signal**  **to DSP AMP** | **Audio Channel** | **Volume Master** | **Distributes audio to Speakers** |
| SYNC External Media (USB, BT Audio) (SYNC)  (RequestedAudioSource = 0x8: APIM  RequesterPriority = $B: Aux\_ExtSource) | S/PDIF (AES3) | DSP | DSP |
| Phone (SYNC)  (RequestedAudioSource = 0x8: APIM or 0x6: Bluetooth Phone  RequesterPriority = 0x1: Telephony Service) | S/PDIF (AES3) | DSP | DSP |
| VR Prompt (SYNC)  (RequestedAudioSource = $4: VoiceRecogniser  RequesterPriority = $4: PttMutevoice) | S/PDIF (AES3) | DSP | DSP |
| AHU Media (all media sources other then SYNCs... ex AM/FM/SDARS...) | Stereo 1 Line Level | DSP | DSP |
| Mixable Prompts (SYNC) | Prompt | DSP | DSP |
| Chimes (AHU) | Alert 1 & 2 | DSP | DSP |
| TA Prompts (AHU) | Stereo 1 Line Level | DSP | DSP |

**Modules present: SYNC Gen1 / AHU / No DSP AMP**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Source of signal**  **To AHU** | **Audio**  **Channel** | **Volume**  **Line Level Output** | **Volume Master** | **Distributes audio to Speakers** | **AHU**  **Volume**  **State** |
| External Media (Sync)  (RequestedAudioSource = 0x8: APIM  RequesterPriority = $B: Aux\_ExtSource) | Stereo In 1 (C346N, C520 and future global radio unless noted otherwise) | Fixed | AHU | AHU | Variable Gain |
| Phone (SYNC)  (RequestedAudioSource = 0x8: APIM  RequesterPriority = 0x1: Telephony Service) | Prompt (SYNC Alert In 1 on Jan 2009 AHU Device Transmittal ) | Fixed | AHU | AHU | Variable Gain |
| VR Prompts (SYNC)  (RequestedAudioSource = $4: VoiceRecogniser  RequesterPriority = $4: PttMutevoice) | Prompt (SYNC Alert In 1 on Jan 2009 AHU Device Transmittal ) | Fixed | AHU | AHU | Variable Gain |
| Non-SYNC Prompt (Navigation) (RequestedAudio Source = 0xA Navigation  ResourceUpdate : RequesterPriority = 0x5 Nav User Voice Cmd or 0x6 Nav Sys Voice command) | Nav Audio  (MFD5) | Fixed | AHU | AHU | Variable Gain & variable Mixing Ratio |
| Mobile Navigation  (RequestedAudio Source = 0xA Navigation  ResourceUpdate : RequesterPriority = 0xC Mobile Nav/Tel Mute) | N/A | Fixed | AHU | AHU | Variable Gain |
| Mixable Prompts (SYNC) | N/A | Fixed | AHU | AHU | Variable Gain |
| Chimes (AHU) | N/A | N/A | AHU | AHU | Fixed Gain |
| TA Prompts (AHU) | N/A | N/A | AHU | AHU | Variable Gain |

Volume Master (volume settings server) shall be responsible for listening to volume change request (volume Button Input Server) and storage of the volume setting sources (Media, Phone, Prompt, VR, TA).

Note: for A2B volume routing see Digital Audio Bus SPSS.

##### VOL-SR-REQ-014848/B-Module that is the Volume Setting Server when AHU and DSP AMP present (TcSE ROIN-39823-2)

When there is both an AHU and DSP AMP on the vehicle at the same time then the DSP AMP shall be in control of the Active Volume Settings Sources (Media, Phone, Prompt, VR, TA) and shall be the Volume Server. When no DSP AMP is present the AHU shall be in control of the Active Volume Settings Sources and shall be the Volume Server.

##### VOL-SR-REQ-014849/B-Display Module Volume signals to look at between the AHU and DSP AMP (TcSE ROIN-39824-1)

When there is both an AHU and DSP AMP on the vehicle at the same time then the display module(s) shall only look at the volume settings status signals from the DSP AMP for display information. The AHU shall set its volume settings status signals to the default values when the DSP AMP is present.

##### VOL-SR-REQ-014850/B-Storage of volume levels by the volume Setting Server (TcSE ROIN-39825-2)

The Volume Settings Server is responsible for maintaining the last known state of the volume levels for the volume setting sources (Media, Phone, Prompt, VR, TA) during all modes of operation and transition of power modes.

##### VOL-SR-REQ-014851/D-Volume Setting Server Incrementing Volume via the EFP/ECP and SWC (TcSE ROIN-39827-2)

The Volume Settings Server shall monitor volume adjustments from the Volume Button Input Client via the 'BCP\_Button\_Press : SetVolume' signal and ‘\_Steering\_Wheel\_Data2 : SteWhlCtl\_Volume\_(Up/Down) – CGEA 1.2 only' signals for incrementing / decrementing volume.

##### VOL-SR-REQ-014852/C-Volume Setting Server changing to a pre-defined volume level with the SetPointVolume signal (TcSE ROIN-39828-2)

The Volume Settings Server shall monitor volume adjustments from the Volume Button Input Client via the 'BCP\_Button\_Press : SetPointVolume' signal for setting predefined volume levels.

##### VOL-SR-REQ-014853/C-Volume Setting Server Updating Volume with the SetVolume.Rq or SetVol\_Level.Rq signals (TcSE ROIN-39829-4)

The Volume Settings Server (ex AHU, DSP AMP) shall update the 'XXX\_Volume\_Level' and "XXX\_Vol\_Updated = Updated' signals within Tvol\_update of the Volume Setting Server receiving the 'SetVolume.Rq' or 'SetVol\_Level.Rq' signals from the Volume Settings Client (ex. APIM Gen 3, MFD…).

##### VOL-SR-REQ-014854/D-Volume Settings Server Updating volume status signals from the Button Input Client (TcSE ROIN-39831-3)

The Volume Settings Server (ex AHU, DSP AMP) shall update the 'XXX\_Volume\_Level' and "XXX\_Vol\_Updated = Updated' signals within Tvol\_update of the Volume Settings Server receiving the volume button press event CAN message from the Button Input Client (ex SetVolume from the ECP, SYNC sending SetVolume for SWC button press).

Note: for the integrated AHU (Volume Setting Client and Volume Setting Server in one module) the CAN Volume Setting Client SetVolume is not necessarily sent since can be internal but logically it is sent and can be used to update the 'XXX\_Volume\_Level' and "XXX\_Vol\_Updated = Updated' signals. (example integrated AHU updating volume status/updated signals: SetVolume from the LIN ICP, SetVolume from the CAN ECP/EFP, SWC button press over CAN…)

##### VOL-SR-REQ-014855/F-Volume Display Updates (TcSE ROIN-39848-2)

The HMI Output shall update the display (if applicable per HMI) within Tdisplay\_update of receiving the signal 'XXX\_Vol\_Updated = Updated'.

The Volume Setting Server should set "XXX\_Vol\_Updated = No Update" unless there is a requirement specifying “XXX\_Vol\_Updated = Updated” for a specified volume event or unless it is specified for the Volume Setting Server to update the Volume HMI.

Note: The XXX\_Volume\_Level.St signals should reflect the volume or stored volume level. The XXX\_Volume\_Level.St signals changing would not cause an HMI update and an HMI update would only occur when XXX\_Vol\_Updated = Updated.

Example using the Vol\_Updated signal (see HMI for details of what is shown on the HMI):

1. The user had previously turned the Media volume to zero and the Volume Setting Server has the Media\_Volume\_Level.St = 0.
2. While at zero the user turns the volume knob down and the Volume Setting Client sends SetVolume = -1 volume step (see applicable requirements for details of using setVolume) to the Volume Setting Server. In response the Volume Setting Server leaves unchanged Media\_Volume\_Level.St = 0 but sets Media\_Vol\_Updated = Updated per SPSS requirement “VOL-REQ-014853 Volume Setting Server updating volume with the SetVolume or SetVol\_Level.Rq signals”.
3. The HMI Output displays some sort of minimum volume HMI if applicable.

Note2: Attn\_Info\_Audio (ex sent for chimes or SYNC\_Alerts mixable prompts) there is no requirement to update the XXX\_Vol\_Updated signal when attenuating audio. So in this case the XXX\_Volume\_Level.St would be attenuated to the lower volume (if was above the attenuation level) but that would not result in XXX\_Vol\_Updated being set to Updated.

##### VOL-SR-REQ-014856/D-Volume Signals usage (TcSE ROIN-39849-10)

The Volume Settings Client & Server shall utilize the ResourceUpdate.St : ResourceRequestStatus = Granted (as defined in the Audio Management section) to identify the Active Volume Settings Source (Media, Phone, Prompt, VR, TA). The Volume Settings Server shall adjust its volume to the volume level of the source Granted in the ResourceUpdate.St message within 60 msec of the Volume Settings Server receiving the ResourceUpdate.St changing a source to "Granted".

The Active Volume Setting Source can play its audio through the loud speakers and monitors volume user adjustments for changing the volume level. When both Prompts and the active audio source are Granted in the ResourceUpdate message then while Prompts is Granted it is the Active Volume Settings Source.

Reference Audio Management SPSS requirement “[AUMGNT-GREQ-014570-Audio Request - Allowable Combinations](http://ivs02.pd3.ford.com:8080/tcr/controller/ObjLauncher?wolf_objectid=19.0.45455336&LID=19.0.7637493)” for a list of the volume settings sources to be used for a particular setting of the ResourceUpdate.St message.

SYNC Mixable Prompts (SYNC\_Alerts : Alert\_Chan = Initialized for Prompts) are independent of the ResourceUpdate signal and are volume user adjustable also. Reference the Alert section of the SPSS for when SYNC prompts are the Active Volume Setting Source.

Chimes are independent of the ResourceUpdate status message and are NOT volume user adjustable.

If adjusting the volume independent of the Active Volume Settings Source from the Volume Setting Client (ex MFD/APIM) then use the SetVol\_Source.Rq signal to identify the source volume is to be adjusted. The SetVol\_Source.Rq can be used with the SetVol\_Level.Rq or SetVolume.Rq signals. When the signal SetVol\_Source is set to 'inactive' then utilize the ResourceUpdate status message to identify the source volume to be adjusted.

Since the SetVol\_Level.Rq and SetVolume.Rq signals are in the same message the Volume Setting Client (ex MFD/APIM) shall only set one signal at a time with the other signal not being used set to inactive.

##### VOL-SR-REQ-014857/E-Manual Audio Mute (TcSE ROIN-205228-2)

The infotainment system audio can be muted by a "Manual Audio Mute" audio request:

AudioRequest.Rq(RequestAudioResource, Front Requester, Not Requested, Manual Audio Mute)

Upon reception of the request the Audio Resource Server shall process the request and gracefully mute the audio output of the infotainment system. When the ResourceUpdate message indicates a manual audio mute is Granted "ResourceUpdate.St (Front Requester, Not Requested, Manual Audio Mute, Granted)" then the Audio Volume Settings Server shall mute the Granted source (ex. no mute of SYNC Prompts, Chimes and applicable sources in table [AUMGNT-GREQ-014552-Audio Request\_Properties of Priorities\_Overview](http://ivs02.pd3.ford.com:8080/tcr/controller/ObjLauncher?wolf_objectid=4.0.54859271&LID=19.0.63426322)).

While the volume is muted and the user adjusts the volume (increase or decrease volume) then the "Manual Audio Mute" shall be released by the Audio Resource Server in the ResourceUpdate.st message and then the Audio Volume Settings Server shall unmute from the last volume step before the mute event.

Note: when a DSP AMP is present the AHU is still responsible for releasing the Manual Audio Mute with a volume change.

The Audio\_Vol\_Level status message will reflect the muted volume but the Media volume setting \_Volume\_Updated bit shall not be set to "Updated" for a manual audio mute transition but remain as "No Update".

While the infotainment system is muted, indicated by ResourceUpdate.St (Front Requester, Not Requested, Manual Audio Mute, Granted), and the Audio Resource Server receives the following audio request:

AudioRequest.Rq(ReleaseAudioResource, Front Requester, Not Requested, Manual Audio Mute)

The Audio Resource Server shall process the request and gracefully un-mute the audio output of the infotainment system. The restored audio volume level shall set to the previous volume level prior to the mute request.

The Audio Resource Server shall store the "Manual Audio Mute" status in case of system interrupts like TA, News, Alarm, Phone and Voice to mute again after the interrupt ends.

##### VOL-SR-REQ-014858/G-Module specific volume requirements (TcSE ROIN-110928-5)

When the ICP (BCP) Volume Button Input Client has a dedicated network connection to the Volume Settings Client (ex ICP LIN connection to the MFD / APIM / integrated AHU) then the Volume Settings Client will send the SetVolume signal to the Volume Setting Server for volume adjustments.

When the Steering Wheel Controls are hardwired to the Volume Settings Client then the SetVolume signal will be sent to the Volume Setting Server for volume adjustments.

For a CAN based EFP the SetVolume signal shall be sent directly to the Volume Settings Server over the infotainment bus.

For the CAN based Steering Wheel Controls using message 0x81 the Volume button presses will be sent directly to the Volume Settings Server over the infotainment bus.

For the CAN based Steering Wheel Controls using message 0x2A1 the Volume button presses will be sent to the Volume Settings Client (ex MFD / APIM / Integrated AHU) and the Volume Setting Client (ex MFD / APIM / Integrated AHU) will then send the SetVolume signal to the Volume Settings Server.

For the CAN based RSEM/RACM (Rear Seat Audio Controls) using message 0x2A2 RACM\_Button\_Press the volume button presses and SetVolume signal will be sent to the Volume Setting Client (ex MFD / APIM / integrated AHU) and the Volume Setting Client will then send the SetVolume signal to the Volume Setting Server.

Note: for the Volume Button Input Server (Button Receiver or Volume Setting Server) receiving the SetVolume and SetPointVolume signals from the Volume Button Input Client (Button Transmitter) reference the following requirements from the Button Strategy section: “BUTTON-GREQ-110929-1-Receivers of SetVolume Button presses” and “BUTTON-GREQ-110930-1-Receivers of SetPointVolume and MFD\_SetVol\_Level Button Presses”.

See CAN dB and Input Translation Matrix for any additional volume press sources.

##### VOL-SR-REQ-292289/A-Volume Press and Hold Error Handling

The receiver of the volume up or volume down button press signal (ex SWCM volume Pressed / Not\_Pressed) shall cancel the volume press and hold feature when:

* A volume button “Pressed” has been on the network without a volume button “Not\_Pressed” for T\_Vol\_RBAP\_Timeout.

OR

* Any volume button press opposite the current volume button press is received (ie volume up vs volume down)
  + Ex. SWC volume Up button is in a volume press and hold state and an EFP rotary volume Down button is set to “Pressed”. The SWC volume up press and hold would be cancelled.

When the volume up or a volume down press and hold is cancelled by any of the scenarios in this requirement the receiver of the volume button press signal shall allow the same volume button press or same volume button press and hold function to occur again when:

* The infotainment system has been powered OFF and back ON again
  + Ex. HMIAudioMode = ON when press and hold cancelled and HMIAudioMode went OFF and back ON again

OR

* A Volume button “Not\_Pressed” signal is received for the particular volume signal (ex from SWCM) that previously sent the Volume button Pressed without a Volume button Not\_Pressed.
  + Ex. SWCM volume up press and hold was cancelled because of T\_Vol\_RBAP\_Timout elapsing without a Volume Up Not\_Press (error on SWCM where didn’t send a Not\_Pressed). The user presses the SWCM volume up button again (nothing happens) but when the user releases the SWCM volume up button if this time the SWCM sends a volume up “Not\_Pressed” then the volume button press and volume button press and hold functionality would work on the next volume button press.

Reference requirements:

* VOL-TMR-REQ-292290-T\_Vol\_RBAP\_Timeout
* BUTTON-SR-REQ-014704-Cancelling RBAP

##### VOL-TMR-REQ-292290/A-T\_Vol\_RBAP\_Timeout

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | **Description** | **Units** | **Range** | **Resolution** | **Default** |
| T\_Vol\_RBAP\_Timeout | The time from when a volume button “Pressed” is received without receiving a volume button “Not\_Press” before the volume press or press and hold function is cancelled.  This is the T\_RBAP\_Timeout value for cancelling the volume button Receiver Button Activation Process (RBAP) for the volume button in Button SPSS requirement “Button-REQ-014704-Cancelling RBAP”  Tolerance for the default value is +/- 100 msec  Note: always use the Default Value | msec | 5000 - 10000 | 100 | 5000 |

#### Media / Phone / Prompt / VR / TA Volume Settings

The Volume Settings Server will have to store multiple volume level settings for different volume sources / prompts and broadcast the volume level status on the Infotainment bus. Note: Chime volume level strategy is discussed in the Alert section.

##### VOL-SR-REQ-014859/B-Media Volume (TcSE ROIN-39859-1)

The Media volume (ie AM / FM / CD / SDARS / DAB / AUX / USB/BT Audio) level is indicated via the Volume Settings Server XXX\_Audio\_Volume\_Level.St() signal. Refer to the Volume Setting Server component requirements for details on volume level outputs for each volume step.

##### VOL-SR-REQ-014860/B-Phone Volume (TcSE ROIN-39861-1)

The Phone volume level is indicated via the Volume Settings Server XXX\_Phone\_Volume\_Level.St() signal. Refer to the Volume Settings Server component requirements for details on volume level outputs for each volume step.

##### VOL-SR-REQ-014861/B-Prompt Volume (TcSE ROIN-39862-2)

The mixable Prompt volume level is indicated via the Volume Settings Server Prompt\_Volume\_Level.St signal. Refer to the Volume Setting Server component requirements for details on volume level outputs for each volume step.

##### VOL-SR-REQ-014862/B-TA Volume (TcSE ROIN-39863-1)

The Traffic Announcement volume level is indicated via the Volume Settings Server XXX\_TA\_Volume\_Level.St() signal. Refer to the Volume Settings Server component requirements for details on volume level outputs for each volume step.

##### VOL-SR-REQ-014863/B-VR Volume (TcSE ROIN-39864-1)

The Voice Recognition volume level is indicated via the Volume Settings Server XXX\_VR\_Volume\_Level.St() signal. Refer to the Volume Settings Server component requirements for details on volume level outputs for each volume step.

### Sequence Diagrams

#### VOL-TMR-REQ-014864/B-Tdisplay\_update (TcSE ROIN-39868-1)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | **Description** | **Units** | **Range** | **Resolution** | **Default** |
| Tdisplay\_update | Maximum time allowed from when the HMI Output module receives the XXX\_Volume\_Level message with an update until the new volume level is updated on the display. | msec | 0-1000 | 10 | 50 |

#### VOL-TMR-REQ-014865/B-Tvol\_update (TcSE ROIN-39869-2)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | **Description** | **Units** | **Range** | **Resolution** | **Default** |
| Tvol\_update | The maximum time allowed from when the Volume Settings Server receives a request to change volume until the Volume Level Status Message is put on the bus. | msec | 0-1000 | 10 | 50 |

#### VOL-SD-REQ-014866/A-Volume adjustment from Volume Button Input Client directly to the Volume Settings Server (TcSE ROIN-39873-1)

Pre-condition

Volume is unchanged

Post-condition

Adjusted Volume level heard through the speakers and if applicable the volume updated on the display

Sequence Diagram



Note: an example for a scenario that would use this sequence diagram (but not limited to this) would be when a CAN EFP sends the setVolume signal directly to the AHU / DSP AMP

#### VOL-SD-REQ-014867/A-Volume adjustment from the Volume Settings Client to the Volume Settings Server (TcSE ROIN-39878-2)

Pre-condition

Volume is adjusted

Post-condition

Adjusted Volume level heard through the speakers and if applicable the volume updated on the display

Sequence Diagram



Note: some examples for a scenario that would use this sequence diagram would be when (not limited to these examples):

* a CAN SWC volume signal is sent from the Volume Button Input Client to the Volume Settings Client (ex APIM, MFD...) and then the Volume Settings Client sends the setVolume to the AHU or DSP AMP Volume Settings Server
* A LIN ICP with volume knob Volume Button Input Client sends setVolume from LIN ICP to Volume Settings Client (ex APIM, MFD..) which then sends the setVolume to the AHU or DSP AMP Volume Settings Server

# Appendix: Reference Documents

|  |  |
| --- | --- |
| Reference # | Document Title |
| 1 |  |
| 2 |  |
| 3 |  |
| 4 |  |
| 5 |  |
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